NASA TECHNICAL MEMORANDUM

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X-Ray Satellite Status Report
First Quarter 1985

Deutsche Forschungs- und Versuchsanstalt
Fuer Luft- und Raumfahrt (German Aerospace
Research Establishment)

Translation of DFVLR Roentgen Satellit Statusbericht, 1. Quartal 1985, Report No. WF2/8346, Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt (DFVLR) (German Aerospace Research Establishment), March, 1985, pp. 1-40, 50-58

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16. Abstract

The project is within the framework of the pregiven plan with regard to technical performance and costs. By introducing a mock-up for the development of the EM (Engineering Model) and FM (Flight Model), the delay of 7 weeks with regard to the previous planned launch date Of September 30, 1987 can be shortened to about 3 weeks maintaining the 4 weeks reserve. As compared with the new EM-AIT (Assembly Integration Test) schedule of March 11, 1985, the EM data handling system is on the critical path. For the attitude measurement and control subsystem, sufficient flexibility was achieved through combination of dummies and EM hardware to catch up with the existing delays.

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X-Ray Satellite Status Report
First Quarter 1985

1. Review and Outlook

1.1. Status of the Work

Summary:

The project is within the framework of the pregiven plan with regard to technical performance and costs. By introducing a mock-up for the development of the EM (engineering model) and FM (flight model) the delay of 7 weeks with regard to the previous planned launch date (September 30, 1987) can be shortened to about 3 weeks maintaining the 4 weeks reserve. As compared with the new EM-AIT (assembly integration test) schedule of March 11, 1985, the EM data handling system (DHS) is on the critical path. For the attitude measurement and control subsystem sufficient flexibility was achieved through combination of dummies and EM hardware to catch up with the existing delays.

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Documentation:

DFVLR-ROSAT Project plan: the plan is submitted to point 7 of endorsement.

NASA-STS Interface Documents: a revised variant of the "Interface Control Document" (ICD) was proposed by NASA.

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*Numbers in the margin indicate pagination in the foreign text.

Development and Production: /4

The production of the EM/QM (quantification model), proto-flight and ground support equipment for EM integration is close to completion. The production of the FM equipment and ground support equipment for FM integration is continuing according to plan.

Tests and Integration:

The qualification of the EM/QM equipment corresponds to the latest planning level. The integration of the QM telescope was started. The mock-up which replaces, temporarily, the delayed structure, has been prepared. The procurement of the electrical ground support equipment for the WFC (wide field camera) EM integration is complete.

Reviews:

During the period under review the 7th and 8th status reviews were held at the main contractors.

Milestones:

Milestone 3 (structural-thermal model (STM) mirror system testing complete for transfer to the telescope) has been reached.

Problems: /5

The schedule is extremely tight. The cost overruns in the sector of focal instrumentation exceed the estimates for the payload in the project plan.

1.2. Outlook

The next project status discussion will be held in May with participation of NASA representatives.

The first subsystems will be integrated into the auxiliary structure.

1.3. A Review of the Problem /6

Sector	Problem Areas	Newly detected	Settled
1. Management	- No problems for the moment with the main contractor		
2. System	- The agreement with NASA on HRI (high resolution imager) random test load is outstanding.	x	
3. Mechanical subsystems	- No problems at present		
4. Electrical subsystems	- No problems at present		
5. Telescope	- The scattered light requirements of the star sensor on the AKS system cannot be satisfied in the present form and must be discussed.		
6. Assembly Integration Test	- Compare 11, schedule - Improvement of the schedule status through a plan option with additional flight structure hardware.		x
7. Ground support equipment	- No problems at present.		/7
8. Mission safety	- It was impossible to order some long-lead items (components). Delayed delivery of components by MBB	x	x
9. Carrier interface	- No problems at present		
10. Mission operation	- Mission operation and simulator development are suffering from lack of personnel	x	
	- The data handling concept is open	x	
11. Schedule	- Deadline postponements have been announced for the subsystems data transmission and the procurement of components.	x	

2.0. System

/8

System Layout

The layout work on the system is complete. The last details on the STS interface and supply of the ion pumps of the experiments have been adjusted and established. To monitor contamination in the system integration work, control mirrors, suitable transport containers, and an evaluating experiment for reflection measurements with these mirrors were set up on the PANTER.

System Budgets

After producing a large portion of the EM hardware it was possible to replace by measurement the previously estimated or calculated values for the system budget mass and power. The mass and power absorption remains within the specified values. The budget for determining the attitude will be revised after the presentation of the results of simulation from the subsystem in the second quarter.

System Documentation

The system specifications have been checked by the contractor and comments given wherever necessary. The required changes were adjusted. During the period under review, the interface specification subsystem and payload have been completely revised again. Comments are given here on the earlier versions and the details, especially with regard to the feed units (connector assign- /9
ments). The specifications on the radiation load (Part III of Cleanliness Spec) is being revised now to be included in the single event upset (SEU) measures.

A first draft of the system verification document has been presented and discussed.

3.0. Mechanical Subsystems /10

3.1. Structure/Mechanisms

It was possible to complete the calculations on the coupled analysis and random response analysis. The results were transferred to the DS (Dornier system) to determine the limit loads and the test loads.

To prepare the static load test, test load calculations were conducted under the following aspects:

1) Reduction to the minimum of the test costs and 2) test of all the components with a margin of safety smaller than 0.2. To this end 5 test load cases were defined.

The work on fracture mechanics (determination of the load cycles, fatigue loads analysis, calculations for keel and sill trunnions, continuation of the list of the parts to be studied from the viewpoint of fracture mechanics, revision of the configurations list) was continued.

The competing bids of the IABG and the DFVLR of Göttingen to carry out the model survey tests have been received and are now being evaluated by the MBB.

The lower support struts of the spacecraft structure for the WFC must be changed, since they collided with the WFC.

Because of the delays in the schedule of the structure MBB intervened in the operation sector management. The production of the components is now being conducted vigorously and on a priority basis. Through the availablity of an auxiliary structure the EM integration /11 can be conducted according to plan, so that the delay in the structure does not affect at present the launch schedule.

It was possible to release the structure verification plan.

In the mechanisms, the vibration and thermal tests on the QM of the antenna cross beam mechanism were carried out successfully. Thus it was possible to deliver it after the documentation is completed along with the QM of the telescope gate mechanism for integration.

The studies of the construction of the separating switch were started. A set of drawings was established for building the test device and sent to NASA for comments on the welded areas of the grapple fixture.

3.2. Thermal Budget /12

It was possible to come to an agreement with NASA on the use of the high cargo bay and orbiter radiator limiting temperatures pre-given by NASA for the Shuttle during the ascent and until the opening of the gates for the use of ROSAT (X-ray telescope). Now a radiator temperature of 45°C (instead of 99°C) and a wall temperature of 40°C (instead of 66°C) are assumed for the thermal project. Thus the components identified as critical, battery, mirror system and star sensors remain within their specified temperature limits.

NASA has already agreed to carry out the very tedious calculations to determine the reentry and landing temperatures. To this end the thermal calculation model was updated to the latest level, the initial temperatures and the gradients to be calculated were established and transmitted to NASA.

With regard to the tight STM (structural thermal model) schedule the verification of the STS in the STM during the solar simulation test was omitted. A functional check of the STS heater is conducted in the FM-TV test.

The drafting of the regulations for the solar simulation test has started.

The work on the production of the MLI (multilayer insulation) thermal mats is proceeding according to plan.

There are no problems at present.

4.0. Electrical Subsystems /13

4.1. and 4.2. Energy Supply, Pyrotechnics

The development status, schedule and revision schedule of the documentation on the two subsystems were checked within the framework of the 7th and 8th status reviews.

The status of the development of the engineering model hardware (EM H/W) is as follows:

- Solar generator

  The plating of the STM solar panel structures delivered by MBB and AEG on March 8, 1985 has begun

- Electronic boxes (power distribution unit, PDU, power control unit, PCU, battery control unit, BCU, shunt, pyro)

  All the boxes are built, tested and released for subsystem integration

  No technical problems were raised in the listed activities

- Battery

  Both battery halves, each with 13 individual cells, have been produced, conditioned, tested and released for subsystem integration

  No technical problems were raised.

The production and tests of the EGSE subsystem was completed.

The EGSE susbsystem has already been used successfully for the equipment and subsystems test.

The status of the subsystem documentation is as follows: /14

- All test regulations for the electronic boxes have been presented for checking. It was established that all test regulations are in excellent state and thus the verification of all requirements is secured.

- For subsystem testing regulations for EMC qualifications and functional testing, which were available for checking in good time before the test, the same statement applies as indicated above.

The status of the development level of the (EM) hardware of both subsystems is as follows:

- The EMC qualification test was carried out at the end of March, 1985, while levels exceeding the controlled disturbances (structure noise) for frequencies over 1 MHz and for the measured HK (housekeeping) signals (potential ripples) were measured.

  The analysis and removal of these disturbances (level 2) whose cause lies in the inadmissible connection of all switching regulators and converters in the power supply system was started.

- The integrated US (subsystem) functional testing is planned for the first week of April.

Schedule

By postponing the beginning of the EM system integration to the middle of April 1985, it was possible to carry out additional tests,

such as vibration (quasistatic) with final functional tests, which /15
were first provided only for the FM electronic boxes, also in the EM test program. These tests will be conducted early in April 1985 and should provide early information about possible changes in design of the FM hardware.

4.3. Wiring /16

The subsystem was checked within the famework of the 7th and 8th status discussions.

The status for development, production and testing of the EM cable harness is as follows:

- The development and production of the bus- (power/pyro/signal) telescope and antenna boom cabling is completed. The second electrical testing will be completed in the first week of April 1985.

- It was decided not to incorporate the STS heater cabling in the EM cable harness (see details in 3.2 Thermal Estimates).

- The test and integration regulations for the EM cabling are established.

The production of the cable harness transport frame was moved up so that it is already available for EM integration.

Schedule, Problems

By postponing the beginning of the EM system integration to the middle of April 1985 and omitting the EM cabling for the STS heater system, it was possible to reduce the enormous time pressure which had been faced by the entire production force since the beginning of April 1985, so that the other activities such as glueing the cable straps to the structure and to the telescope tube and the

preparation of the integration of the cable harness in the integration structure can be carried out in the normal work schedule. Technical problems have not arisen during the period under review.

4.4. Data Handling /17

After the wiring of the data processing system (DPS) case it was possible to start the hardware integration. Most plates have been produced and tested successfully for this integration. But it was necessary to improve certain minor defects for some of them. Because of these improvements, the repair of damage which had occurred and delays in the delivery of individual components, it was not possible to keep to the originally planned delivery schedule. It is not possible to rely with certainty on the DPS being completed before April 26. This deadline is moreover an extremely tight estimate and will not be maintained if the cost for the software revision which was absolutely necessary to reduce the storage needs, exceeds the established framework.

The EM band instruments were handed over to the DS after the successful completion of the qualification tests.

It was possible to achieve the connection between the DPS and its test equipment with the operation of most channels according to plan. The remaining work still open with totally integrated DPS is considered critical because of the breadboard experience.

4.5. Data Transmission /18

Transponder

The production of the two FM transponders has been completed. On the basis of the experience with the L-SAT transponder it was necessary also to modify the power converters of the ROSAT flight unit. In the acceptance tests, instability was detected. The tests had to be interrupted. After correcting the defect, the tests

will be resumed. The delivery of the transponders is delayed by this measure by about 4 weeks, to May 20, which is compatible with the AIT schedule now in force.

Decoder

The production has been completed. The tests show satisfactory behavior of the decoder. The EM and the corresponding documentation were delivered according to plan.

Antenna

The EM was subject to thermal vacuum tests. In these tests a deformation of the hybrid was detected. The necessary correction measures were established in a decision by the main review board (MRB). The necessary correction measures have not given rise as yet to any problems for the delivery deadline.

4.6. Measurement and Regulation of Attitude /19

The work on the design and coding of the AMCS software and the software needed for subsystem tests was continued.

Star Sensor

In the lens system of the star sensor head, a defect was detected early in the year which required a dismantling of the sensor head and the optical system. The causes of the defect were analyzed and correction measures introduced. In the meantime, a CCD chip of better quality was available from the FM program, the star sensor head was equipped with it. This measure makes it possible in the EM program to verify fully the operability as originally planned. It was possible to make available CCD chips for the flight models from the FM batch. A new batch had to be set up to achieve flight ecomony.

Gyroscope Package

The EM of the gyroscope package was tested successfully. It is now back at the manufacturers for conversion of the final power supply. The defective FM gyroscope was replaced. The other FM gyroscopes were subject to intensive testing, which confirmed that they may all be used as FM.

Solar Sensors

The solar sensors have been developed, the first test gave rise to no complaints.

Magnetic Coils /20

Magnetic coils have been delivered. No problems have been detected so far.

Magnetometer

A quartz of the magnetometer electronic system had to be replaced by a qualified type. To this end, modifications were needed in the electronic system. The magnetometer measurement head operates without any trouble.

AMCE

On the basis of the changes in the magnetometer electronic system and the measures for ensuring the safe mode, the AMCD is now being used with preliminarily modified plates. After incorporating the final plates the qualification program will be continued.

AMCD

The EM was delivered and tested. The defects appearing during the tests were eliminated so that it was possible to release the

FMs.

Reaction Wheels

The EM (wheel with electronics) was delivered and tested. The tests did not reveal any defective behavior operationwise, though problems were detected with regard to electromagnetic compatibility which made it necessary to return the wheel and electronic system to the manufacturer for revision.

Subsystem Deadline Status /21

MBB is making intensive efforts (by overtime on a very large scale) to the agreed delivery deadline of the EM subsystems of August 1, 1985. If nevertheless, delays should arise, they can be compensated in the AIT plan now in force.

5.0. Payload /22

5.1. X-ray Telescope

The telescope specifications SP-20002-5000 DS/000 second edition was released with comments by the DFVLR-PL*.

5.1.1. Hardware Work

To prepare for telescope integration the DS established a detailed schedule which was adjusted with the modified EM-AIT plan (compare chapter 6.0). The work on the telescope is progressing in accordance with this plan.

After producing the components the telescope integration started with the assembly of the front telescope tube, the STM mirror system, parts of the alignment control system and the thermal hardware.

The integration of the magnetic deflector and the rear telescope

* DFVLR-PL = DFVLR Project Management

tube has been delayed. The thermal shield is still under production. Since it must be incorporated as the last component before the optical test and the assembly of the FI vocal plane instrumentation mass model in the telescope, it will be presumably available in due time for integration by the middle of May.

5.1.2. Mirror System

The STM mirror system was qualified mechanically in January. Both the strength qualifications (low frequency "quasistatic" sine load) and the random qualification were implemented successfully. The STM was ready for transfer to the DS on February 6, 1985 (milestone M3). The formal transfer was completed the following week. /23

The production of the Invar structural path of the FM mirror system at MBB is still within schedule. Residual stresses in the material of a cementing flange led to inadmissible deformation which required additional heat treatments. This jeopardizes the delivery date to C. Zeiss for the mirror system assembly.

The status of the work in the separate contracts for the overall system in the ROSAT project at C. Zeiss is as follows:

After successful ending of the work of the verification model, the adjusting stand and additional devices, the only separate contract not completed is that of the production of the individual mirrors of the flight model. Because of problems arising during the production (for example, bearing damage on the A-800 production device) additional processes were needed in the manufacture of the individual mirrors. This led also to additional tests of mirrors on the PANTER X-ray testing unit. The delays arising in this connection can be made up so that the delivery date established by contract for the final flight mirror and the beginning of assembly of the flight mirror system are not jeopardized.

Because of the additional individual mirror tests and the longer

occupation of the PANTER test plane connected with this, MPE (Max Planck Institute for Physics and Astrophysics, Institute for Extra-terrestrial Physics) indicated that because of this the conversion and preparation schedules for the testing of the flight mirror system are very tight and the preparation time for the conversion of the plant for tests may not be sufficient. Auxiliary measures are being studied by DFVLR and MPE.

5.1.3. Focal Instrumentation /24

The development and production of the FI continued during the period under review. The essential points are:

- continuation of integration of the FI-EM
- mechanical integration of the HRI-EM into the FI-EM structure
- successful electrical acceptance of the incorporated HRI-EM
- establishment of FI-vibration regulations (in the MPE-at DS)
- production of the FI mass model.

It is not planned to carry out any FI vibration tests at a subsystem level, but to complete the qualifications at the component level. This possibility is available because in the modified AIT plan (chapter 6.0) the FI delivery deadline was shifted.

Three problems remain open:

- the DFVLR-PL and GSFC have different concepts regarding the random vibrations of the HRI;
- the loads which were obtained by DS on behalf of MPE from the results of the FI structural test seemed inadmissibly high to the GSFC. Since the data are based on test results, they represent realistic requirements in the opinion of the DFVLR-PL. This question should be clarified at the latest, by the end of May 1985.

- The MPE has announced a delay of a few months in the production of the FI-FM. Auxiliary measures are being studied which would prevent the system schedule from being jeopardized.

- For cost reasons only one flight model of the carousel drive was built for the FI. This drive is now incorporated in the FI-EM, but will be required in September 1985 for FM assembly. MPE is studying whether a spare drive can be provided which would be changed after the electrical integration of the FI-EM before the incorporation of the FI-EM in the telescope. As an alternative it is possible to implement the further EM-test program with fixed carousel without drive.

5.2. WFC /26

- With regard to the Level-0-document "Spacecraft/XUV wide field camera interface requirements" the English partner proposed two changes which, recommended by project management, were transmitted to Dornier Company as technical directives Nos. 29 and 30.

- The English experimenter made three request for waivers: two regarding the loads in the vibration tests and one regarding the EMC. Although the formal proceedings for approval have not been completed, we can expect an approval by the project management for at least two proposals.

- On February 19 the SERC Readiness Review of the EM of the WFC was held in the RAL (Rutherford Appleton Laboratory) with the participation of the project management.

- The routine interface discussion on March 13 within the framework of the status meeting at the Dornier Company was used to clarify open points and the considerable work progress achieved.

- The electrical ground support equipment (EGSE) of the wide field camera:

was sent from England to the Dornier Company

was approved after successful testing by the project management

is delivered to the Dornier Company in due time and according to contract (this was the first fulfillment of a deadline regulated by contracts from the experimenter sector). /27

- Data handling plans--as far as the GSOC (German Space Operation Centers) is concerned, are being further discussed within the framework of the EORD (Experiment operations requirements document).

- The required time for checkout of experiments on the RMS-arm of the shuttle and the consequences of a go/no go decision will be further discussed.

On the basis of the revised AIT plan, the ADP (acceptance data package) review deadline plan for March 1985 was postponed to April for WFC-EM.

- No problems have been detected at present with regard to EM delivery according to schedule.

6.0. Assembly, Integration and Test /28

The occurrence of the delay in integration, which arose because of the delayed production of the central structure now being produced at MBB, should be eliminated through an auxiliary structure used for the preintegration of EM components. The delivery considered of a second flight structure was rejected since there were doubts about its timely completion.

The auxiliary structure consists of metal covered wood, therefore a part of the subsystems for the payload can be integrated only electrically. Special measures were taken for the repeated conversion of the heavy cable harness. No final decision has been

made yet in the procedure for the flight integration, but here too, the auxiliary structure should be used.

In the period under review the AIT plan was revised and the working plans indicated in the AIT were obtained in further detail. With the establishment of the integration procedures and the availability of the data recording system for the electrical interface measurements, the prerequisites have been obtained for the integration starting with the cable harness and energy supply system.

The deadline of the solar simulation tests was postponed from the period between December 5, 1985 and January 31, 1986 to the period between January 7, 1986 and March 4, 1986.

The deadline has meanwhile been the object of a binding agreement with the IAPG. For the same period the board members have shown interest in the TV-Sat project.

The flight unit of the carousel drive of the focal instrumentation will be needed from the middle of the year by MPE for adjustment work to the flight model. Since no spare drive will be available by then, DS and MPE are trying to evaluate the effects on the EMC and the solar simulation test and the additional time needed for later incorporation.

7.0. Ground Support Equipment /29

7.1. EGSE and Check-out Software

The electrical ground support equipment including all peripheral units is completely available and can be used.

The connection of WFC-EGSE through Decnet-I/F is taking place completely according to plan, the checking of the FI-EGSE-I/F is still continuing, but here too, a successful connection may be expected with certainty.

The ESA-software (EBCS-ESA basis checkout software) modified for ROSAT by ESTEC has been delivered complete and installed on the EGSE computer.

The work on the remaining software packages (for example, establishment of monitoring cable, ETOC-test sequences and others) is proceeding according to plan and making excellent progress in accordance with the expected time of use.

7.2. MGSE /30

The vibration adapter, the spacecraft transport container, the spacecraft trolley and the telescope support frames have been completed mechanically. They are now being tested.

The equipment of the spacecraft transport container and trolley have started.

The establishment of test regulation and handling procedures was continued.

7.3. OGSE

After delivery of the STM mirror system it was incorporated into the optical test stand to carry out the operation tests for transfer from C. Zeiss to DS. The optical test stand was handed over on February 13, 1985.

Subsequently, the optical test stand was transferred by DS to the new integration hall.

8.0. Mission Safety /31

STS safety (flight and ground operation)

- The deadline established in November 1984 with DS as a working basis (September 1985) was still confirmed for the next

safety test (phase 2) within the framework of the 8th status discussion. The verification of the structural safety (tests, reports) must be provided complete for the next but one safety check (phase 3).

It was agreed with DS and the suppliers of the WFC, FI that the integrated test packages for flight and ground operation would be available by the end of June 1985 for sending to NASA. We may start from the fact that the safety philosophy for the "Orbiter Interface Box -OIB-" will be included by NASA in future safety checks.

- The status of the documentation relevant to "Safety" is as follows:

The structure verification plans for software and WFC have been accepted and released by the GSFC project management.

The structure verification plan for the FI should be completed by the end of June 1985.

A revision of the list material is being prepared and should be completed by the beginning of May 1985, while an attempt is being made to include this revision in the accepted or release form into the safety check package.

Reliability

The revision of the "single point failure list", reliability analyses and the establishment of the FMECA for software and subsystems have been completed.

The documents were sent in April 1985 to the project management for checking.

Central component procurement

During the period under review the activities were distributed among the following partial sectors:

- order or reorder of components
- final negotiations of the MBB agency with the two test centers EPI (D) and electronic stations (DK) on the supplies of 30 "line items" LIs (21 LIs from technical, 9 LIs in addition to the HIREL procurement for reasons of time) to be upgraded to the ROSAT standard
- establishment, issue, checking and discussion of the "Project declared component list" of March 5, 1985, especially for the essential sectors

  delivery according to the agreed "need dates" of the user

  delays of component delivery ("delivery delays")

- inspection (WEK) and delivery of the components reaching the agency.

In the last two partial sectors indicated, problems have arisen during the period under review which could lead to as yet unforseeable effects on the further progress of the project.

The problems, their status and the plan measures for eliminating /33 them can be summarized as follows:

- delay in the delivery of assemblies for the AMCE (Ds system)

  Status: The 8 KW/1985 was the "need date" for 859 LIs, for the AMCD of which altogether 821 LIs have been in the delivery storage at the agency since KW 44/1984. Of these

821 LIs, 125 LIs were delivered during the period under review, which except for 4 items were only LIs of passive components. The result of this situation is that the causes of the delay must obviously be sought in the internal procedures of the MBB.

Measures of elimination: The MBB project management had declared at the 8th status discussion that it would be working primarily in the operation sector to eliminate the bottlenecks for delivery of the components for the AMCD whose "need date" had been jeopardized.

No noticeable improvements could be detected yet in the operational procedure by the end of the period under review.

- decrease in quality in the CMOS ICs (manufacturer: SGS Company, Rennes (France))

Status: At the time of goods acceptance control (100% visual inspection) discolorations were observed on ICs from the entire CMOS spectrum for the ROSAT and DFS projects, (defective gold plating) on the "leads" /34 were established immediately at the outputs from the "dual inline" cases.

The study of the causes which is being pursued now at the agency and at the manufacturers is not yet complete.

The results will be presented and discussed in April 1985 in a project involving the MRB at SGS with the participation of DS, SFVLR-PT, Arge Detecon/DFVLR, MBB-ERNO,

CNES and ESA.

Effects on the project implementation:	These latter will be studied as soon as the results of the MRB are available.

9.0. Carrier Interface /35

PIP JSC 18410

In January 1985 the "basic" version (of December 13, 1984) of the "Payload integration plan" was applied to the project management. It was possible to obtain an agreement with the contractor on the requests for modification proposed by him for this edition.

ICD-A-18410

- The "preliminary version" (February 15, 1985) of the ICD was supplied to the project management of NASA-JSC with the requests for checking. To achieve as quickly as possible the "baseline" version of the ICD, the GSFC requested that the checking of the present version should be included in the joint status discussion held in the middle of May 1985.

- All the design data required for the development and building of the "OIB" have been meanwhile supplied to NASA-JSC. NASA-JSC is planning to conduct in June 1985 a checking of the OIB development stand. DFVLR and DS will be taking part in it.

PIP-Appendices

- The "L&L program requirement document" (PRD) accompanying the "Launch site support plan" (PIP Appendix 8) Vol II cargo has been checked. Suitable comments were made to NASA-KSC.

- The priority of further revision is assigned to:

PIP-Appendix 2: Part II: Flight activity planning. /36

Establishment of the final version:
June 30, 1985
Discussion with NASA: September 1985

PIP-Appendix 5: The revision is being conducted under the responsibility of the project management.

It is planned to discuss with NASA in September 1985 the NASA input established by the end of June 1985 and with comments of the DS.

PIP-Appendix 8: The checking of the "Preliminary issue January 1985" of the "Launch site support plan" is completed with regard to PRD.

It is appended to include the Appendix 8 in the January 1985 version in the joint status discussion to be held in the middle of May 1985.

Status of the NASA deliveries according to PIP of December 13, 1985, Fig. 15-1 /37

- RSGF Mock up: Delivered by SPAR, Canada on March 15, 1985

- SURS combination:
  Monoball/swivelbearing/pigtail: Not yet delivered.
  It is planned to announce to NASA the delivery date for the FM at the beginning of May 1985.

10.0 Mission Operation /38

On the basis of recent analyses of the data handling requirements of MPE, the GSOC data handling concept was revised. An extension of

the data handling capacity at the Oberpfaffenhofen Computer Center and GSOC seems to be inevitable. Necessary funding will be obtained after the presentation of the detailed concept.

To replace the originally planned ROSAT-GSOC data system compatibility test (end of 1986) the possibility is being studied of connecting the satellite during the system tests and environmental test phases on data control with the GSOC. A proposal for the interpretation of this is available and is now being tested by the project management.

The radio frequency compatibility test between ROSAT and the ground station in Weilheim is being conducted with the "suitcase" model. The deadline planned is April 1986.

NASA ground stations were taken up as back-up for difficult mission operating problems in planning the ground operation system.

The methods for the post facto attitude determination of GSOC were finally established at the functional level. Since the end of 1984 a member of the DFVLR has been working at MBB to study the operation of the AMCS.

The specification of the software and the procurement of the required software for the ROSAT-AMCS simulator development has started. A proposal was presented to the board for the separate financing of the simulator by the BMFT (Federal German Ministry for Research and Technology).

11. Schedule /39

The nominal data now valid for the launch date have been established as follows:

1. Contract milestone plan, M11: October 30, 1987
2. NASA schedule in PIP: September 30, 1987

The last complete system schedule by Dornier of December 10, 1984 gave as launch date November 17, 1987.

There is at present only a partial plan of March 11, 1985 for the systems level for EM, QM, STM AIT, which taking into consideration a preintegration on a structural mock-up and subsequent conversion of subsystems into the structure, ends the EM phase on March 21, 1986 (end return transport to DS). As compared with the previous system schedule of April 30, 1984 with the indicated launch schedule of September 30, 1987, this means a delay of 7 weeks for the EM phase. The continued use of the mock-up for the FM integration would reduce this delay for the launch date to about 3 weeks according to preliminary estimates while maintaining a 4 week buffer, so that the contract milestones can be maintained.

The schedule of March 11, 1984 is taken as basis to evaluate the delays in the EM-progress. Quantitative data on the identified delays for EM equipment are not available for the period under review. Qualitative indications regarding future delays are available for the data handling system.

13.0 Appendix /50

13.1 Personnel Utilization of the DFVLR Project Management and work teams

ROSAT - BARCHART
EM.QM.STM AIT

ISSUE : 4

MON	11.03.85
A:	BITZER
T.	PB?

BARRIER SYSTEM
FRIEDRICHSHAFEN

PLAN: 8-86 PAGE: 1

WK. DAYS/PLU: 5 WK. DAYS/WEK:5 HRS/DAY: 8.00

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ERNO RAUMFAHRTTECHNIK GMBH BREMEN

Blatt 40

BARCHART

1985 | 1986

SHR NUM	ACTIVITY DESCRIPTION	ACT. DUR.	EARLY START	EARLY FINISH
2	MR.PLS.HUB & OPT.TEST	7.0	11FEB85	03APR85
4	STP-MR,ST-STR/MR THERM.H/W	3.0	04APR85	08APR85
6	OPT.TEST, THERM.BAFFLE.TCH.FI-MR.ALIGNM.	2.0	09APR85	11APR85
8	TRANSP..& VIBR. TELESC. AT IABG	4.2	22APR85	25JUN85
10	OPT.TEST,ALIGNM.	2.0	26JUN85	15JUL85
12	MOUNT.FI-EN, THERM.H/W.	1.0	16JUL85	29JUL85
14	HARNESS INTEGR.	1.0	12APR85	18APR85
18	POWER S/S INTEGR.	1.0	19APR85	25APR85
16	DECKEN INTEGR.	0.6	26APR85	30APR85
20	Unit-HANDL.INTEGR.	2.0	02MAY85	15MAY85
22	PTAS INTEGR.	0.6	20MAY85	22MAY85
24	TRANSPONDER INTEGR.	1.0	23MAY85	30MAY85
26	WFC-EN ELECTR.INTEGR.	1.0	31MAY85	10JUN85
28	FI-EN ELECTR.INTEGR.	1.0	11JUN85	18JUN85
30	DISMOUNT. ALL BUS-UNITS	0.6	19JUN85	20JUN85
32	BUFFER	2.0	21JUN85	08JUL85
34	STRUCT.PREPERATION	0.6	09JUL85	11JUL85
36	HARNESS INTEGR. & THERM.H/W.	1.0	12JUL85	18JUL85
38	REINSTALL.OF ALL UNITS & THERM.H/W.	1.0	19JUL85	25JUL85
40	-E PANEL BLANKET MONT.	0.2	26JUL85	26JUL85
42	TELESC.INTEGR. & THERM.H/W.	0.6	29JUL85	01AUG85
44	SUPP.STRUCT.-/CENTR.SC & THERM.H/W.	1.4	02AUG85	12AUG85
46	ANTENNA BOOM INTEGR.& RELEASE TEST	0.4	13AUG85	14AUG85
48	WFC-STR INST. & THERM.H/W.	0.6	15AUG85	20AUG85
50	DISM.AX/TR-OPS,AT.AX/TR-OPS MECHNCS STMS	0.6	21AUG85	23AUG85
52	TRANSP.TO IABG	0.6	26AUG85	29AUG85
54	MODAL SURVEY-TEST	2.6	30AUG85	10SEP85
56	TRANSP.TO BS	6.0	11SEP85	20SEP85
58	OPS PCB'S EXCH.	2.0	20AUG85	06SEP85
60	RF SUITCASE TEST	2.0	05SEP85	09SEP85
62	WFC STR/EN EXCH.& INST.OF PMCS-ER UNITS	0.6	23SEP85	25SEP85
64	OPTIC.ALIGNMENT	0.6	26SEP85	30SEP85
66	MMCS ELECTR.INTEGR.	2.0	01OCT85	14OCT85
68	PRE-IST	2.0	15OCT85	04NOV85
70	IST	2.0	05NOV85	18NOV85
72	BLANKET (THERM.H/W.) INTEGR.	1.6	19NOV85	29NOV85
74	TRANSP.TO IABG	0.6	29NOV85	04DEC85
76	SOLAR SIM TEST	0.2	05DEC85	31JAN86
78	TRANSP.TO BS	0.6	03FEB86	06FEB86
80	WFC-EN/STR EXCH. & BOOM INTEGR.	0.6	07FEB86	10FEB86
82	EMC, CONDUCTION	1.4	11FEB86	19FEB86
84	TRANSP.TO MBB	1.4	20FEB86	26FEB86
86	EMC, RADIATION	2.2	03MAR86	17MAR86
88	TRANSP.TO BS	0.6	18MAR86	21MAR86
90	DISMOUNT.STM	2.2	24MAR86	04APR86
92	RF SUITCASE TEST (ESC)	1.0	07APR86	23APR86
94	STRUCT.TRANSPORT & REFURBISHMENT (MBB)	9.2	10APR86	25JUN86
96	TRANSP.,TELESCOPE MODAL TEST (DFL)	4.0	10APR86	13MAY86

SHR NUM | ACTIVITY DESCRIPTION | ACT. DUR. | EARLY START | EARLY FINISH

1985 | 1986

ROENTGEN SATELLIT

Personnel Utilization **DFVLR-PT**

STATUS: March 31, 1985

	Period	Nominal	Actual	Period	Nominal	Actual	Period	Nominal	Actual	Period	Nominal	Actual
t. I	12/84	13.0	8.2	1/85	13.5	8.1	2/85	13.5	8.6	3/85	13.5	9.1
t. II		3.5	0.9		3.5	1.0		3.5	1.0		3.5	1.0
t. III		4.0	4.1		4.0	3.5		4.0	3.1		4.0	3.4
All together (MJ)		20.5	13.2		21.0	12.2		21.0	12.7		21.0	13.5

ROENTGENSATELLIT

Personnel Utilization DFVLR-WT

STATUS: March 31, 1985

	Period	Nominal	Actual	Period	Nominal	Actual	Period	Nominal	Actual	Period	Nominal	Actual
I	1/85	6.0		2/85	6.0		3/85	6.0				
II	====	6.0		====	6.0		====	6.0				
III		1.0			1.0			1.0				
Contractors												
All together (MJ)		13.0	5.6		13.0	7.6		13.0	8.1			

13.2. List of Abbreviations /53

ADP	Acceptance Data Package
AIT	Assembly, Integration and Test
AMCD	Attitude Measurement and Control Data Unit
AMCE	Attitude Measurement and Control Interface Electronics
AMCS	Attitude Measurement and Control Subsystem
BAT	Battery
BCU	Battery Control Unit
Bit. Sync.	Bit Synchronizer (Synchronization)
BMFT	Bundesminister für Forschung und Technologie (Federal German Ministry for Research and Technology)
CCD	Charge Coupled Device
CCL	Charge Current Limiter
CDH	Command and Data Handling
CEL	Control Electronics
CFK	kohlefaserverstärkter Kunststoff (Reinforced carbon faser (sic) plascic)
CFRP	Carbon Fiber Reinforced Plastics
CITE	Cargo Integration Test Equipment
Cmd	Command
CPU	Central Processing Unit
CSA	Charge Solar Array
CSS	Coarse Sun Sensor
CZ	Firma Carl Zeiss (Carl Zeiss Company)
DC	Direct Current
DEC	Decoder
DFVLR	Deutsche Forschungs- und Versuchsanstalt für Luft- und Raumfahrt (German Aerospace Research Establishment)
DHS	Data Handling Subsystem /54
DMA	Direct Memory Access (Direct Access to Memory)
DMOD	Demodulator
DNEL	Disconnection of Non-essential Loads
DPS	Data Processing System

DS	Dornier System
ECS	Environment Control System
EED	Electro-Explosive Device
EEL	Experiment Electronics
EGSE	Electrical Ground Support Equipment
EM	Engineering Model
EMC	Electromagnetic Compatibility
EOL	End-of-Life
EORD	Experiment Operations Requirements Document
EPD	External Power Dumper
EUV	Extreme Ultraviolet
FI	Focal Plane Instrumentation
FLS	Fiducial Light System
FM	Flight Model
FWHM	Full Width at Half Maximum
GF	Grapple Fixture
GSE	Ground Support Equipment
GSFC	Goddard Space Flight Center
GSOC	German Space Operations Center
GVS	Gas Supply System
GYP	Gyropackage
GYPE	Gyropackage Electronics
GYPS	Gyropackage Sensor
HC	Heater Control /55
HEAO-2	High Energy Astronomy Observatory ("Einstein")
HK	Housekeeping
HP	High Power
HRI	High Resolution Imager
INVAR	(Trade name for a special steel alloy)
JSC	Johnson Space Center

kbps	Kilobit per second (German: kbit/s)
KSC	Kennedy Space Center
LCL	Latching Current Limiter
LED	Light Emitting Diode
LHC	Left-hand Circulation
LP	Low Power
MA	Mirror Assembly
MAC	Mirror Attachment Cone
Mbps	Megabit per second (German: Megabit/s)
MC	Magnetic Coil
MCC	Mission Control Center
MCP	Microchannel Plate
MDM	Multiplexer/Demultiplexer
MED	Magnetic Electron Deflector
MES	Mechanisms Subsystem
MGSE	Mechanical Ground Support Equipment
MLI	Multilayer Insulation
MM	Magnetometer
MOU	Memorandum of Understanding
MPE	Max-Planck-Institut für Physik und Astrophysik, Institut für Extraterrestrische Physik (Max-Planck Institute for Physics and Astrophysics, Institute for Extraterrestrial Physics)
MPG	Max-Planck-Gesellschaft (Max Planck Association) /56
MPSS	Mission Planning and Scheduling System
MRB	Material Review Board
MSA	Main Solar Array
MUC	Multi-Use Container
MUDAS	Modular Universal Data Acquisition and Control System
MVL	Main Voltage Limiter
NASA	National Aeronautics and Space Administration
NRZ/L-Code	Non-Return-to-Zero/L-Code
NDI	NASA Standard Initiator

OBC	Onboard Computer
OGSE	Optical Ground Support Equipment
OIB	Orbiter Interface Box
OSR	Optical Surface Reflector
PCU	Power Control Unit
PDU	Power Distribution Unit
PETS	Payload Environmental Transportation System
PGHM	Payload Ground Handling Mechanism
PHP	Paraboloid-Hyperboloid Pair
POCC	Payload Operations Control Center
PPF	Payload Processing Facility
PSE	Payload Support Equipment
PSK	Phase-shift Keying
PSPC	Position Sensitive Porportional Counter
PSS	Power Supply Subsystem
PYB	Pyrotechnics Electronic Box
QM	Qualification Model
RAL	Rutherford Appleton Laboratory /57
RE	Radiated Emission
RF	Radio Frequency
RMC	Right-hand Circulation
RMS	Remote Manipulator System
ROSAT	Röntgensatellit (X-ray Satellite)
RS	Radiated Susceptibility
RSS	Rotating Service Structure
RT	Real Time
RW	Reaction Wheel
RX	Receiver
S/C	Spacecraft
SERC	Science & Engineering Research Council
SEU	Single Event Upset
S/L	Serial Load

SOC	Science Operations Center
SPL Code	Split Phase Level Code
SSM	Single Surface Mirror
ST	Star Tracker
STC	Star Tracker Camera
STE	Star Tracker Electronics
STM	Structural Thermal Model
STS	Space Transportation System
TC	Telecommand
T/C	Thermal Control
TCE	Thermal Conditioning Equipment
TCS	Telecommunication Subsystem
TM	Telemetry
TR	Tape Recorder
TT&C	Telemetry, Tracking and Command /58
TV	Thermal Vacuum
TK	Transmitter
US	Subsystem
VPHD	Vertical Payload Handling Device
VPF	Vertical Processing Facility
WDE	Wheel Drive Electronics
WFC	Wide Field Camera
WSA	Weltraumsimulationsanlage (Space Simulation Unit)
XRT	X-ray Telescope
ZERODUR	(Commercial name for the glass-ceramic material of the mirror)
ZDE	Central Data Electronics